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(54) Entrance mat

(57) An entrance mat comprises a flexible sheet material held in position by rods arranged so that the sheet protrudes above the rods. Preferably the sheet 13 has pile at least on the exposed portions and is held on a substrate base 11 having indents 11a which accommodate the rods. The rods may be mounted on hinged arms.

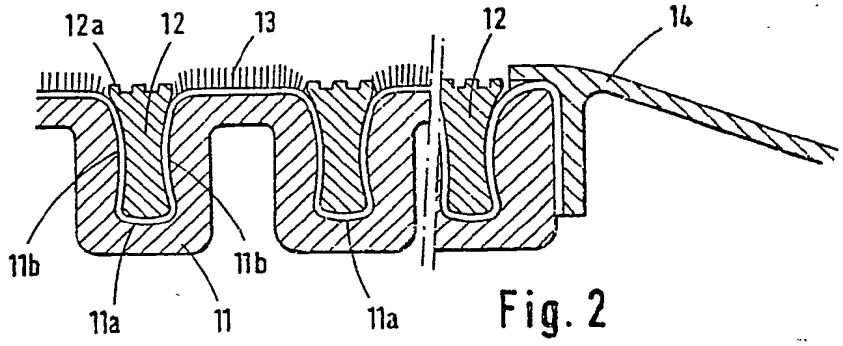

Fig. 2

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The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

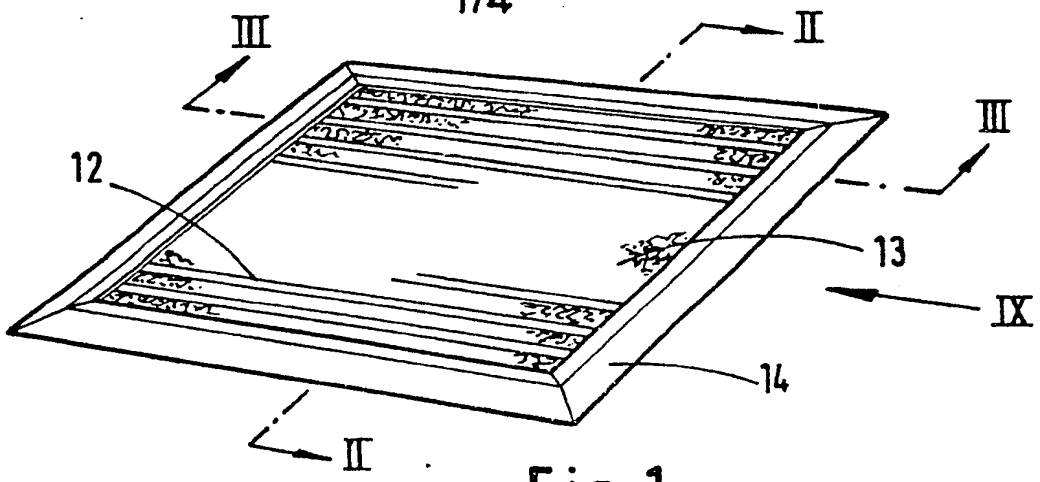

Fig. 1

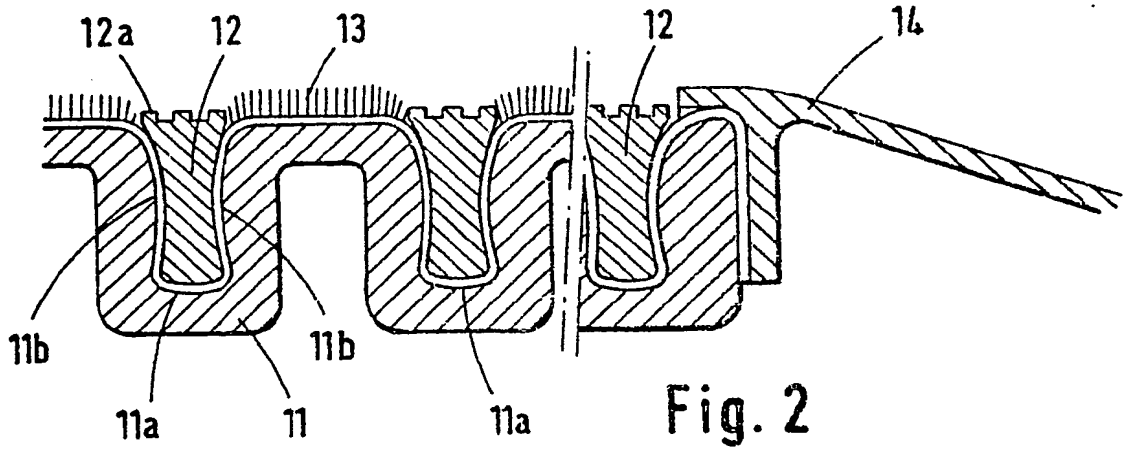

Fig. 2

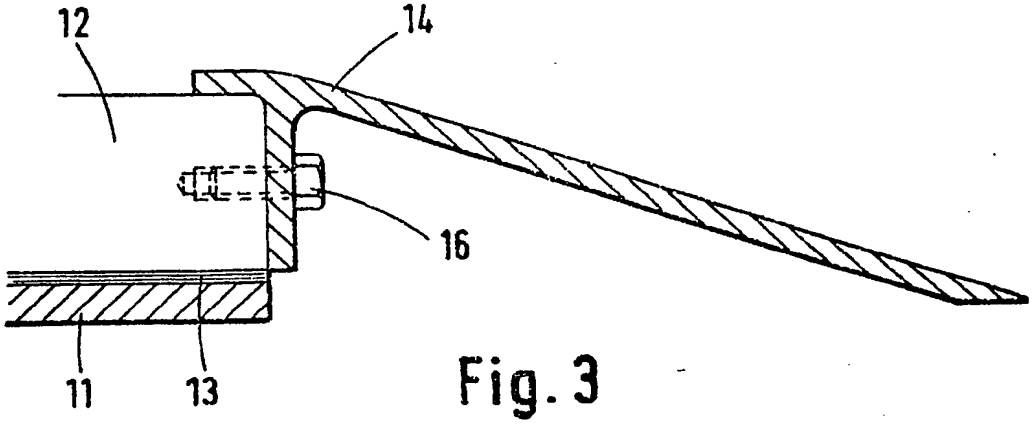

Fig. 3

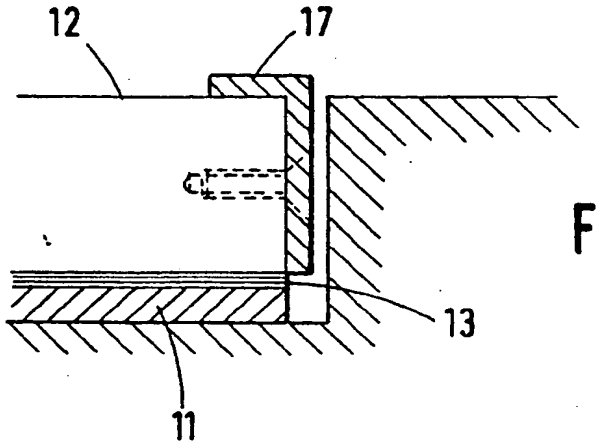

Fig. 4

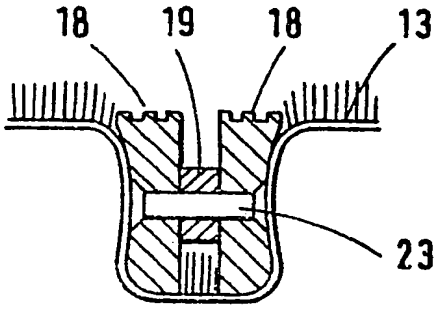

Fig. 5

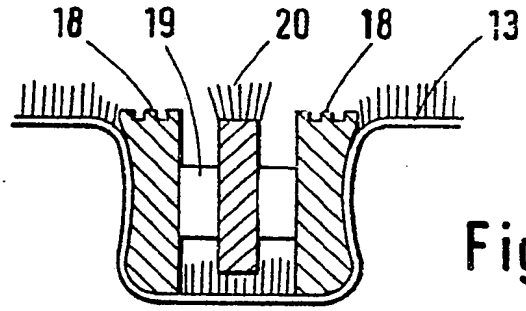

Fig. 6

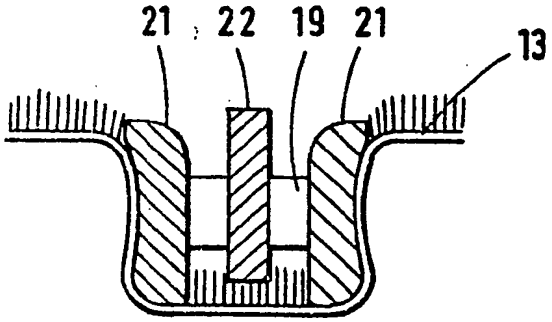

Fig. 7

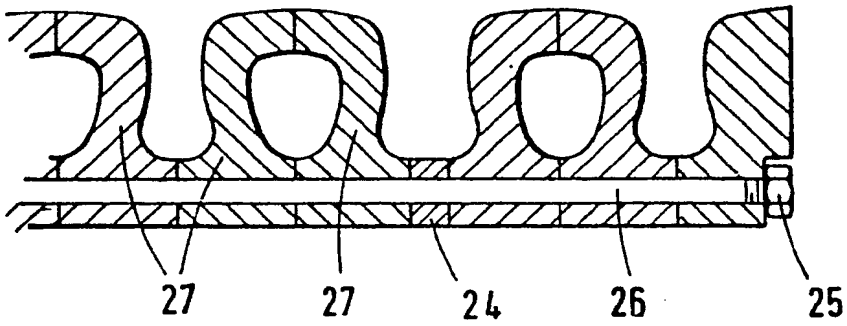

Fig. 8

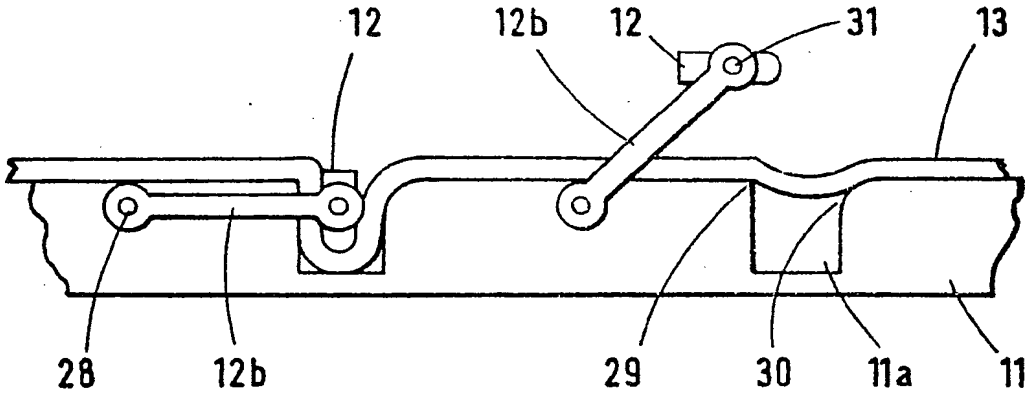

Fig. 9

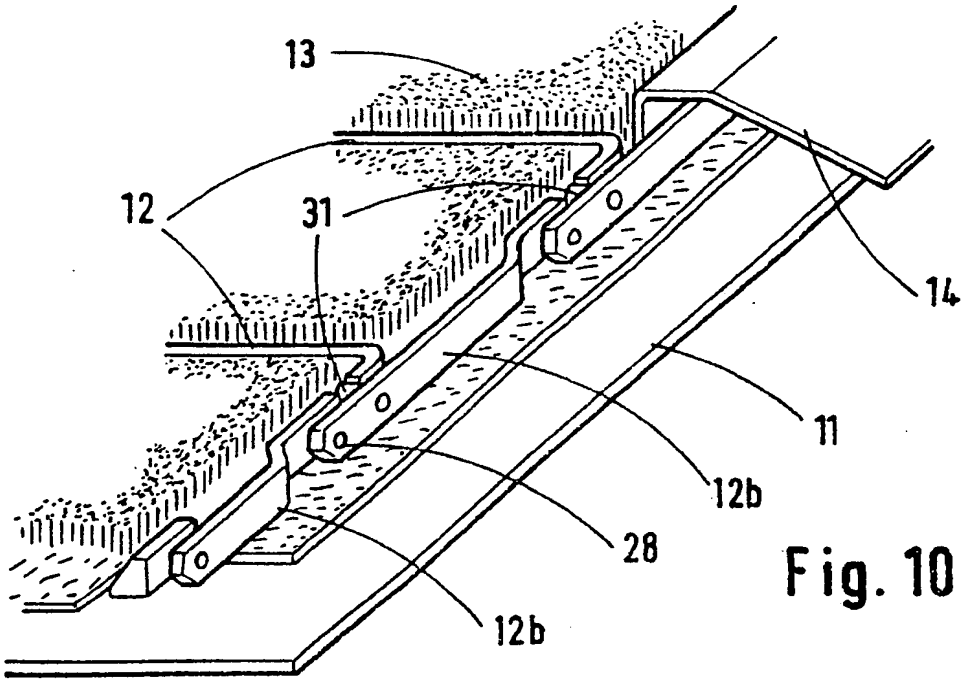

Fig. 10

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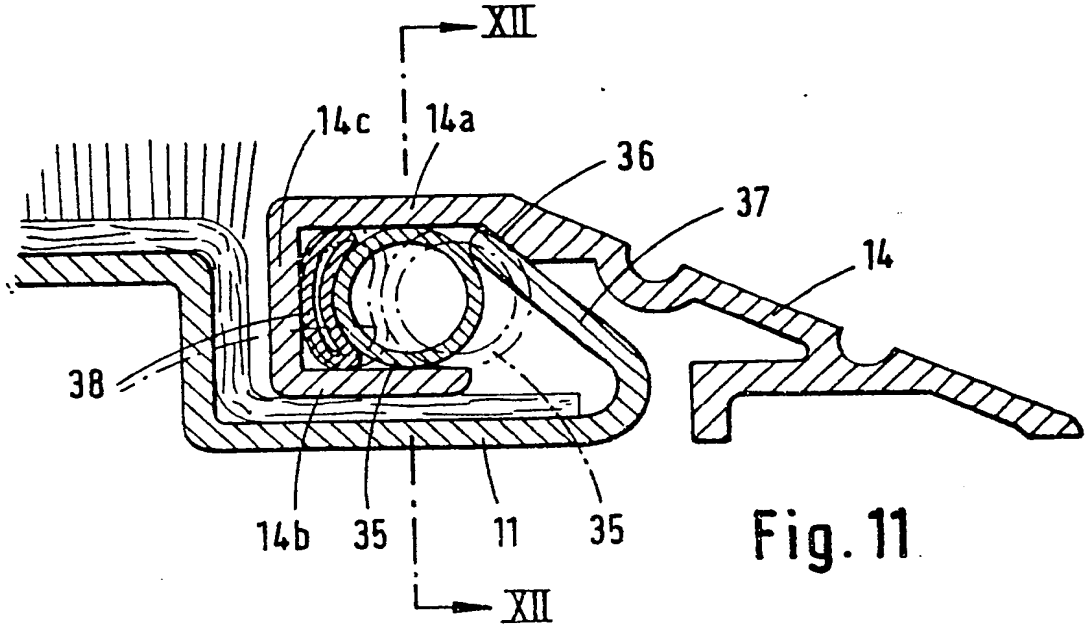

Fig. 11

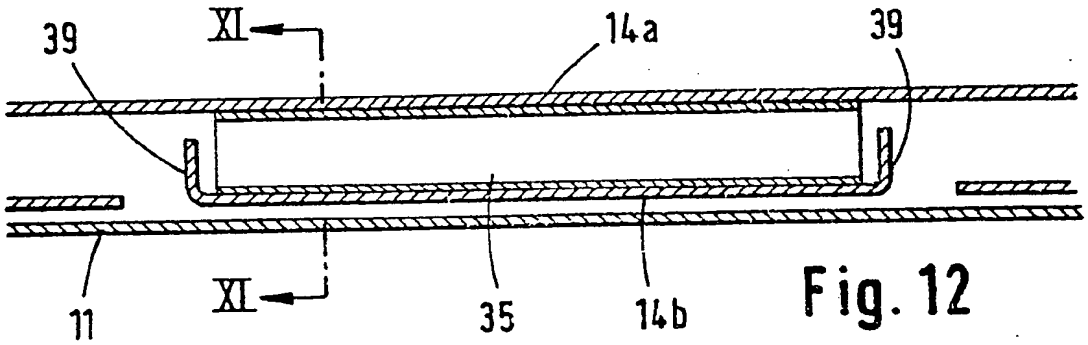

Fig. 12

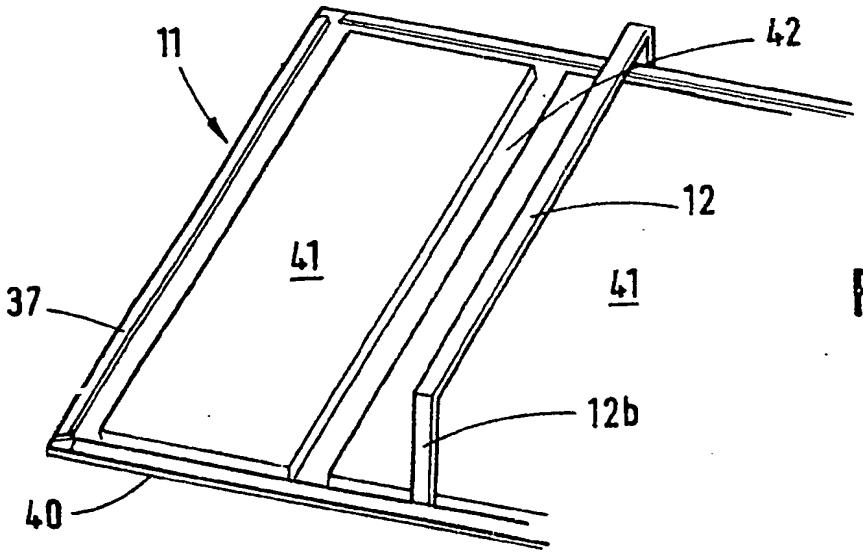

Fig. 13

SPECIFICATION

Entrance mat

The invention relates to mats, particularly, but not exclusively, for use in building entrances to reduce the amount of dirt brought into the building on footwear.

Entrance mats of various types are well known, many being sunk into a shallow floor well so that the upper surface is substantially flush with the floor. Traditional types have a woven back with upstanding bristles sufficiently densely packed to support the weight of a person whilst trapping the dirt and soil in the pile. Another type comprises rubber or metallic strips spaced apart to define soil-trapping strip-strip spaces. Brush strips are sometimes provided in the strip-strip spaces to assist in soil removal from footwear as are wider strips providing a carpet or pile fabric.

Another type of entrance mat comprises pile fabric coated on its underside with latex or a layer of rubber. In both cases dirt trapped is difficult to remove from the mat, cleaning, at the regular intervals needed, normally requiring lifting from a floor well and, in the case of the rubber-backed mats, removal from the premises for laundering.

In both cases the weight of the mat can make the task of cleaning inconvenient but latex-backed mats are sufficiently light that removal for cleaning is a practical proposition and the washing process itself is reasonably efficient and economic to carry out. Despite these advantages over rubber-backed mats, however, the latter are often preferred since, in sharp contrast to latex-backed mats, they are not easily displaced, or rucked and tend to lay flatter so as to be safe in use.

Attempts have been made to produce entrance mats combining the relative ease of cleaning of latex-backed mats with the service advantages and safety of rubber-backed mats. In one case, a base has means such as clamps around its edges for removeably attaching to it a light-weight latex-backed mat which covers the base. The stability is, however, often inadequate since the attachment of the mat only at its edges is insufficient to control a large surface area.

According to the invention an entrance assembly comprises a sheet of preferably latex-backed flexible material, a plurality of bars designed to extend across the upper surface of the sheet when it lies on a substrate and means for retaining the bars in preferably releasable contact with the upper surface of the sheet to fix the sheet in position relative to the substrate.

In preferred forms of the invention, the mat assembly includes a base member which defines the substrate. Means such as indents in the base member may be provided, to provide local surement of the sheet material to the base member. In the case of indents the bars and sheet are located in the indents to better prevent movement of the sheet relative to the substrate. The bars may also be supported by the side walls of the indents, and the thickness of the sheet in the indent, to limit their horizontal movement perpendicular to their longitudinal axis. The base may be one-piece or may comprise a plurality of parts joined by means such as clamps, bolts, screws or by interlocking of parts so configured as to facilitate such joining.

Means may be provided to retain the bars, together with that part of the sheet on which they bear, in the indents so that the sheet is gripped and held in a fixed position relative to the base member until such means is actuated to release the sheet. The bare may also be attached to means by which they are movable, either together or separately, towards and into the indents and out of and away from the indents.

Conveniently, the mat assembly may include a frame to surround the flexible sheet material so as to cover and trap its edges and means are provided for detachably securing the frame to means defining the substrate, the elongate members optionally having securement to the frame.

The flexible sheet material may comprise a non-woven or woven fabric made from polyester or other fibre, yarns of high twist nylon, cotton, wool, polyester, other fibres, or mixtures of two or more thereof being tufted into the fabric. Alternatively, a sheet of disposable material such as toughened paper or disposable non-woven fabric, may be used as the sheet material. In a location where clean room conditions, as in nuclear or electronic laboratories for example, must be maintained, the surface of the sheet may be tacky, for example as a result of coating with a tacky substance. Where a high friction surface is required, the surface of the sheet may be in whole or in part comprise a non-slip surface formed, for example, from carborundum chips. The flexible sheet material may be a composite of more than one sheet either separate from each other or joined, for example, by adhesive. By way of example, a sheet of open-pore foam plastics material of the type used to make scouring pads may be placed on top of a moisture absorbent sheet of cotton felt to provide a mat having good abrasion and wear characteristics and high moisture absorbency.

The surface of the sheet need not be the same in character over its whole area. Thus, for example, a pile fabric may be tufted only in the areas exposed to view when the bars are positioned in the indents or the mat assembled in a frame. In some cases, the presence of a surface finish to the sheet may make the bars difficult to insert into the indents referred to earlier. For example, the resilience of a tufted pile can urge the bars upwards and out of the indents whilst a surface finish having a high friction coefficient may prevent the bars being moved easily against the surface of the sheet as they push the sheet into the indents. In these and other cases, such finishes can beneficially be omitted or replaced by others on localised areas of the upper surface of the sheet material.

Electrically conductive sheets may be provided to discharge static electricity from persons stepping on the mat, the bars pressing on the sheet being connected to earth.

The bars which cross the upper surface of the mat may be of various widths and construction in order to provide tread surfaces different in character and properties. For example, in a simple form, a bar may be a 3mm metallic strip 15mm wide and of a length ac-

cording to the width of the mat. The 3mm edge forms part of the tread surface and may be serrated, ridged, or sloped to provide varying degrees of scraping, abrasion or friction to the soles of footwear. Bars may be T-shaped, the upper surface (or cross) of the bar extending on each side of the part (stem) pressed into the indent so as to produce a neater appearance and enable the bar to have a greater effect on the surface characteristics of the mat.

Bars will usually but not necessarily be parallel to each other in the same horizontal plane and will usually but not necessarily cross the sheet in a direction opposed to that taken by pedestrian traffic walking over the mat.

Bars may have blunt projections or serrations on their underside to better grip the sheet material. Sharp projections may similarly be provided to penetrate the sheet material and locate it positively relative to the substrate.

The upper surface of a bar may not be in the same plane as the surface of the flexible sheet material. It may, for example, be slightly below it in order to reduce contact between footwear and the bar so that the mat has a surface characterised mainly by the sheet. If raised slightly above the surface of the sheet, the bar will receive more load and this may be more approriate in some instances. For example, to provide a mat particularly suited to locations where snow will be deposited on the mat, the bars may be raised above the surface of the flexible sheet typically comprising a tufted cotton pile. In this way, the pile when heavily loaded with water from melted snow is not squeezed by foot pressure on the pile.

Bars may be sufficiently small in cross-sectional dimension to be bedded in a pile on the surface of the sheet material and be protected by the yarns of the pile from the displacing action of use, eg footwear being scraped on the mat. The pile acts as lateral support for the bars, in such cases indents in the base conveniently being very shallow or even omitted. For example, bars in the form of cylindrical rods 1.5mm in diameter may be removably bedded into a nylon pile 12mm deep to provide a small mat for domestic use, the pile being tufted, for example, into a polyester non-woven sheet substrate.

The following specific description is intended to illustrate the invention, by way of example only, reference being made to the accompanying drawings in which:-

Figure 1 is a simplified perspective view of one embodiment of a mat assembly according to the invention;

Figure 2 is a cross-section, shown in part only, taken along the line II-II of Figure 1;

Figure 3 is cross-section, shown in part only, taken along the line III-III of Figure 1;

Figure 4 shows an alternative embodiment of the mat of the invention, placed in a floor depression or well;

Figure 5 is a cross-section, similar to Figure 2, showing an alternative form of bar construction;

Figure 6 is a cross-section, similar to Figure 2, showing a further alternative form of bar construction;

Figure 7 is a cross-section, showing still further alternative form of bar construction;

Figure 8 is a cross-section, similar to Figure 2, but showing an alternative form of base construction;

Figure 9 is a side view, taken from the direction of the arrow IX of Figure 1, some components having been removed to expose details of construction;

Figure 10 is a perspective view of a further alternative embodiment of the invention;

Figure 11 shows the system of attachment of the frame and base, taken along the line XI-XI of Figure 12;

Figure 12 is a cross-section taken along the line XII-XII of Figure 11; and

Figure 13 shows a further form of base bar assembly, in part only.

The mat assembly shown in Figures 1 to 3 of the drawings comprises a base 11, a sheet of flexible material 13 and a plurality of bars 12.

The base 11 defines a rectangular substrate formed with a plurality of parallel bar-receiving recesses of indents 11a. The base 11 is made of vacuum-formed resilient plastics material, for example any of the synthetic rubbers widely available. Walls 11b defining each of the indents or recesses 11a are configured with a constriction past which the bars and accompanying sheet material may be passed by resiliently deforming the walls, a bar and sheet received in the recesses or indents 11a then being retained in the recess or indent by what can be characterized as an interference fit. The base 11 could be constructed with only the upper part of the walls 11b from the constriction upwards being composed of resilient plastics material although in practice convenient methods of production available dictate that the material of the base will be homogenous.

Sheet 13 comprises a non-woven substrate into which is tufted a high-twist nylon yarn. A thin layer of rubber is bonded to the rear of the substrate to give the sheet more stability and strength and to bond the tufts to the substrate. In the embodiment shown, the non-woven material of the substrate is polyester fibre but, as mentioned earlier, other materials may be used.

As an alternative to providing a base 11 in form of a unitary vacuum formed plastics moulding, base 11 may take the form of a plurality of strips 27 (Figure 8) bolted together by means of elongate rods 26 threadedly engaging by their ends with nuts 25. As shown in Figure 8, this arrangement is quite flexible in the sense that the width of the indents or recesses 11a can be varied by the insertion of spacers 24. The strips 27 may be made by extrusion of a suitable plastics material, resilience being a practical requirement in the case of the embodiment shown in Figure 8 since the walls of the indents or recesses 11a are configured to facilitate an interference fit with the bars 12.

As shown in Figure 2, the bars 12 have a configuration which compliments that of the recesses or indents 11a so as to facilitate the interference fit referred to earlier. Each bar 12 is made of stainless steel strip and is provided with an exposed contoured surface 12a intended to provide a relatively firm friction grip with the soles of footwear and to facilitate removal therefrom of soil.

Each of bars 12 is pivoted by a pin 31 (Figure 9) to a mounting arm 12b. The latter are also made of stainless steel strip material and each is pivotal upon a hinge pin 28 in a vertical arc. It will appreciated from Figure 9 that in the raised condition of the mounting arms 12b, the bars 12 are disposed in a horizontal orientation. The contour of the sheet material 13 on the substrate in overlying relationship with respect to the indents 11a causes the bar 12 to rotate on contact with the sheet 13 in a clockwise direction so that when fully received in the indent, the bars 12 have a vertical orientation as shown in the left hand part of Figure 9.

The width, depth and shape of the bars and indents is determined by the character of the sheet material 13, the purpose of the mat assembly and the means by which the mat assembly is to be assembled from its components. In the embodiment shown in Figure 9, the mat is assembled by raising all the bars 12 from the base 11, placing the sheet 13 on the base 11 and lowering the bars 12 sequentially into the indents 11a. The bar 12 shown in Figure 9 in its relative indent 11a traps the sheet 13, the latter therefore being capable of movement only in one direction to provide the length of sheet which will enter the indent under the bar being lowered. The upper corner 29 of the indent may therefore be sharp since the sheet 13 does not slide against it. The opposite corner 30 of the indent 11a should in practice, however, have a shape which allows the sheet to be drawn over it without undue load as the sheet and bar enter the indent 11a. The underside of the bar may also be curved to reduce friction as the sheet moves under it. The base may be shaped so that in conjunction with the shape of the bars 12 and the thickness of the sheet 13, a seizing or locking effect is produced when the bars 12 and sheet 13 are pushed into the indents 11a.

It will be appreciated that bars 12 used in the various depicted embodiments of the invention may take any of a variety of forms with a view to providing manufacturing convenience or particular service qualities. For example, one form of bar 12 may comprise two strips 18 (Figure 5) joined together by rivets 23 at spaced apart locations along their length. The strips 18 are spaced apart by means of washers 19, the spacing size being so chosen as to prevent entry of small heels such as those commonly provided on female footwear, the strip-strip space, however, serving as a soil-receiving well. As an alternative to this arrangement, two strips 18 may be more widely spaced apart by two washers 19 (Figure 6) which sandwich a brush strip 20 therebetween. Similarly, a raised strip 22 (Figure 7) may be provided instead of brush strip 20 to provide a means for footwear to be scraped to remove soil and deposit it in the two portions of the soil-receiving well either side thereof. In this arrangement, strips 18 are conveniently provided with rounded upper edges 21 to facilitate the scraping action. The strips 18 will, of course, normally be made of the same stainless steel material referred to earlier in connection with bars 12 and raised strip 22 may be made of the same material, whilst brush strip 20 may be made of the same material or perhaps of a plastics material. As will be evident from Figures 5, 6 and 7, the flexible sheet 13 forms a base to the soil-receiving wells formed by the spaces between the strips 18. Accordingly, the dirt entering the soil-receiving wells is retained above the sheet 13 and accompanies the sheet when it is removed for cleaning. Water deposited in the soil-receiving wells drains to the base of the wells and is absorbed by the flexible sheet material 13. The elevation of the upper surface of components of bars 12 normally means that footwear pressure on the mat assembly will not squeeze water from the sheet 13, such water being retained by the material of the sheet up to its limit of absorbtion and largely accompanying the sheet when it is removed for cleaning.

Loading means (not shown) may be provided to load the bars 12, in addition to their own weight, so pressing them to the base and trapping the sheet. Such a loading means may be used to deform the base 11 by pressing the bars into its body without an indent first being provided, the base in this case being made from a material which can be so deformed and is sufficiently elastic to react against the load and trap the sheet, such as foam rubber or foam plastic. In such a case, indents in the base are formed wholly or partly by the temporary deformation of the base.

In the embodiment of Figure 1, the bars 12 are secured by bolts 16 to a frame 14 (Figure 3), the latter serving both to cover and trap edges of the sheet 13 which are not covered by the bars 12 and, together with the bars 12, to form a grid which may be raised from or lowered into the base 11.

As mentioned earlier, the thickness of entrance mats is commonly accommodated in a floor well or depression so that the upper tread surface of the mat is essentially flush with the surface of the floor substrate. Although the frame 14 referred to earlier may be included, perhaps in modified form, when the mat assembly is to be disposed in a floor well, it is preferred to provide an angle section 17 (Figure 4) to finish the edges of the assembly. As shown in Figure 4, angle section 17 covers and traps the edges of the sheet and also provides a frame into which the bars 12 may be mounted.

In the arrangement shown in Figure 10, each of the bars 12 is linked to an adjacent bar means of a hinge arrangement 28 between the mounting arms 12b of the participating bars. In this arrangement, the bars 12 form a chain so that the individual bars may be lowered sequentially onto the sheet 13 and into the indents 11a. As shown in Figure 10, the sheet 13 is a pile fabric having pile removed around its edges and alternating non-pile areas between the edges so spaced apart as to be capable of registration with the indents (not shown in this Figure). Each bar 12 presses onto the bar previously lowered into its relative indent or recess 11a by means of a peg 31. In this way, lifting of a bar in use is prevented by the next bar in sequence. The first bar 12 in the sequence is hinged to the base 11 and the last is clamped to the base by any suitable means (not shown).

The frame 14 is of rectangular form and made of aluminium extrusion. The cross-sectional configuration of part only of each of two opposed sides of frame 14 is as depicted in Figure 11. A stainless steel

cording to the width of the mat. The 3mm edge forms part of the tread surface and may be serrated, ridged, or sloped to provide varying degrees of scraping, abrasion or friction to the soles of footwear. Bars may be T-shaped, the upper surface (or cross) of the bar extending on each side of the part (stem) pressed into the indent so as to produce a neater appearance and enable the bar to have a greater effect on the surface characteristics of the mat.

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Figure 6 is a cross-section, similar to Figure 2, showing a further alternative form of bar construction;

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Figure 9 is a side view, taken from the direction of the arrow IX of Figure 1, some components having been removed to expose details of construction;

Figure 10 is a perspective view of a further alternative embodiment of the invention;

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Sheet 13 comprises a non-woven substrate into which is tufted a high-twist nylon yarn. A thin layer of rubber is bonded to the rear of the substrate to give the sheet more stability and strength and to bond the tufts to the substrate. In the embodiment shown, the non-woven material of the substrate is polyester fibre but, as mentioned earlier, other materials may be used.

As an alternative to providing a base 11 in form of a unitary vacuum formed plastics moulding, base 11 may take the form of a plurality of strips 27 (Figure 8) bolted together by means of elongate rods 26 threadedly engaging by their ends with nuts 25. As shown in Figure 8, this arrangement is quite flexible in the sense that the width of the indents or recesses 11a can be varied by the insertion of spacers 24. The strips 27 may be made by extrusion of a suitable plastics material, resilience being a practical requirement in the case of the embodiment shown in Figure 8 since the walls of the indents or recesses 11a are configured to facilitate an interference fit with the bars 12.

As shown in Figure 2, the bars 12 have a configuration which compliments that of the recesses or indents 11a so as to facilitate the interference fit referred to earlier. Each bar 12 is made of stainless steel strip and is provided with an exposed contoured surface 12a intended to provide a relatively firm friction grip with the soles of footwear and to facilitate removal therefrom of soil.

ions thereof.

12. A mat assembly as claimed in Claim 11 wherein the recesses or indents are defined by surfaces configured to provide an interference fit with the elongate members.

13. A mat assembly as claimed in Claim 12 wherein the recess or indent-defining surfaces are deformable to permit elongate member entry to the recesses or indents and capable of resilient recovery to oppose elongate member removal.

14. A mat assembly as claimed in any preceding claim wherein a frame is provided to surround the flexible sheet material so as to cover and trap its edges and means are provided for detachably securing the frame to means defining the substrate, the elongate members optionally having securement to the frame.

15. A mat assembly as claimed in any preceding claim wherein at least one of said elongate members comprises two or more generally parallel strips joined together at spaced apart positions.

16. A mat assembly as claimed in any preceding claim wherein the elongate members sandwich sheet material against the substrate.

17. A mat assembly comprising a base member defining a substrate having a plurality of elongate recesses therein, a plurality of elongate members secured to said base member and displaceable pivotally relative to the base member between a position in which said elongate members are disposed in respective recesses and a position in which the elongate members are disposed remote therefrom, and a sheet form flexible member which can be disposed upon said substrate-defining member and secured relative to said substrate by sandwiching sheet material in said recesses by means of said elongate members to produce a tread surface defined by the balance of the sheet material member in cooperation with exposed surfaces of said elongate members.

18. A mat assembly substantially as hereinbefore described with reference to, and as illustrated in, any one of the accompanying drawings.

19. A mat assembly kit comprising a flexible sheet form member, a base member defining a substrate upon which to support said sheet form member and a plurality of elongate members for disposition over and across the substrate in positional stability-imparting contact with an upwardly facing surface of the sheet form member, means being provided to secure the elongate members in the aforesaid disposition.

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